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BULLETIN NO. 68

JAPANESE FOODS COMMONLY USED IN HAWAII

By
CAREY D. MILLER, Specialist in Nutrition

ISSUED 1933



UNIVERSITY OF HAWAII
Honolulu, T. H.

HAWAII AGRICULTURAL EXPERIMENT STATION

HONOLULU, HAWAII

(Under the joint supervision of the University of Hawaii, and the Office of Experiment Stations, United States Department of Agriculture.)

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Honolulu, Hawaii

November, 1933

**JAPANESE FOODS COMMONLY
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By

CAREY D. MILLER, Specialist in Nutrition¹

INTRODUCTION

The purpose of this bulletin is to give brief scientific and practical information regarding some Japanese foods commonly used in Hawaii. It is hoped that these data may be of value to teachers, dietitians, extension workers, and others who are interested in the nutritive value of foods used in the islands. The bulletin also should serve the younger Japanese as a source of information concerning the preparation and relative dietary importance of their racial foods.

A few carefully selected recipes with caloric values are included with the idea that they may be of use especially to hospital dietitians and to doctors who may be interested in the composition of food mixtures.

¹The author is indebted to J. C. Ripperton, chemist, and to D. W. Edwards, junior chemist of the Hawaii Agricultural Experiment Station, for analyses of most of the local foods reported upon; to Mr. Ripperton for photographs from which the illustrations were made; to Ruth Robbins, assistant in nutrition, for some of the analyses; to Kiyo Arita, county extension agent, for the Japanese names and characters and valuable information on Japanese food customs; to Moto Machida, Hanaya Shimodao, and Kisako Haida for their excellent cooperation; and to members of the agricultural extension service of the University of Hawaii for statistics on imports. Some analyses have been taken from Dr. T. Saiki's exhaustive work, "The Chemical Analysis of Food in Japan" (12) published in Japan after this work was started.

SOYBEAN PRODUCTS

EDAMAME (GREEN SOYBEANS)²

FIGURE 1.—Edamame or green soybeans

The Japanese use several varieties of fresh green soybeans. In Honolulu whole plants are purchased from the vegetable market. The pods are removed from the plants, placed in boiling salted water, and boiled for about 25 minutes. They are then drained and cooled, and the beans are kept in the pods until eaten. Often children eat them out of a bag as they would candy.

² The name of the food in Japanese is given in each illustration.

The fresh green soybeans appear to be an excellent food. They are good sources of calcium, phosphorus, and iron, yield a basic ash, and, as compared with other fresh vegetables and fruits, have a remarkably high protein content. Vitamin tests in progress at the nutrition laboratory of the Hawaii Agricultural Experiment Station show that the cooked beans are very good sources of vitamins A, B, and G. The more general use of green soybeans should be encouraged in the home, and their consumption may be increased by selling them in school cafeterias.

TOFU (SOYBEAN CURD)

Tofu, or soybean curd, is a white cheeselike product manufactured from soybeans. The common method of manufacture in Hawaii is as follows:

The soybeans are soaked in water for about 8 hours and then crushed between millstones until of a uniform consistency, the mass being mixed with about 3 times its volume of water during the grinding. The mass is placed in a large container and heated for three quarters of an hour, being gradually brought to the boiling point. After boiling for about 3 minutes, it is strained through a heavy cloth bag. The residue constitutes kirazu. The liquid is white and opaque, resembling milk, and contains more than 30 percent of the total protein of the crushed beans. To the liquid is added either pure calcium chloride or, more often, a solution containing magnesium and calcium sulphates obtained in the manufacture of salt from sea water in Japan. The protein material is thus precipitated in combination with calcium and magnesium salts as a flocculent curd, and is molded in a wooden frame lined with cloth, through which the liquid is drained off. The curd is subjected to pressure for about half an hour. It is then removed from the frame, usually cut in 3 to 3½ inch cubes, and placed in large receptacles of clear water.

About 350 pounds of bean curd are obtained from 100 pounds of dried beans, but the amount may differ somewhat with the method of manufacture. The amount of curd obtained depends on the amount of water used, the quality of the beans, and the fineness of grinding.

In making tofu from soybeans the oriental people have evolved a method of producing a food of relatively high protein content, 9 percent, with little carbohydrate and no crude fiber, which increases the coefficient of digestibility of the protein. The average coefficient of digestibility of protein of legumes is only 80 percent, whereas the coefficient of digestibility of the protein of tofu is 96 percent.

Pian (9)³ in China recently showed that the biological value of the protein of tofu is 65 percent as compared with 85 percent for milk, 52 percent for white flour, and 38 percent for navy beans. Tofu contains about one fourth as much calcium, more than half as much phosphorus, and 8 times as much iron as does milk. Soybeans have a high calcium and iron content, but about half the calcium remains in the kirazu residue and half comes out with the bean milk. More iron and phosphorus are removed in the bean milk than remain in the kirazu.

³ Italic numbers in parentheses refer to Literature Cited, p. 40.



FIGURE 2.—SOYBEAN PRODUCTS

Top: Kirazu or tofu residue. Left center: Tofu or soybean curd. Right center: Tonyu or soybean milk. Bottom: Aburage or fried soybean curd.

The blocks of tofu, as ordinarily sold, weigh about 1 pound and retail universally for 5 cents each. At this price 100 calories will cost approximately 1.4 cents, so that tofu may be considered a relatively cheap energy food. What is more important, it is a cheap source of protein of high digestibility and comparatively high biological value. Bread at 10 cents a pound is twice as expensive as a source of protein and less completely digested. The relatively cheap cuts of meat and fish are at least twice as expensive sources of protein as is tofu. Only rice and legumes are as cheap sources of protein as is tofu. The use of tofu should be encouraged from both nutritional and economic standpoints.

Wan (16, p. 360), in recent investigations in China, found that bean milk is richer in vitamin B, but lower in vitamin A, than is cow's milk. Shimoda and his coworkers (14, p. 350), in previous experiments in Japan, however, showed that, whereas the bean milk contains some vitamin B, the tofu made from it contains very little. No data are available on the vitamin A content of tofu.

Tofu is prepared every day and is sold at the shop where it is made, or is delivered to small food shops or homes by push cart or by automobile. During delivery and in the home tofu is kept in cold water to prevent the cubes from breaking. Since tofu cannot be kept fresh without refrigeration for more than a day, it is usually consumed on the day of purchase. Tofu may be used as often as every other day by Japanese families using Japanese foods. It may be eaten in the fresh state with shoyu, or it may be used in soup, or cooked with meat, fish, or vegetables in a variety of dishes. When it is to be kept without refrigeration, tofu may be placed in boiling water and boiled for a few minutes, or it may be cut in slices about one half inch thick and fried in fat for use in any dish desired the following day.

KIRAZU (TOFU RESIDUE)

Kirazu, or the residue of the soybeans left when tofu is made, has a crude fiber content of 3 to 4 percent, contains 4 to 5 percent of the protein of the beans, more than 1 percent of fat, and 5 to 6 percent of carbohydrate.

Only a small part of kirazu is used for human food in Hawaii, by far the greater part being used as hog feed. Kirazu, however, is a utilizable, inexpensive food and might be more generally used than it is. One cup, or about 171 grams, of kirazu will yield 100 calories. The calcium, phosphorus, and iron content is relatively high, but the vitamin content is undoubtedly low. Kirazu is used in combination with vegetables, or with fish, or dried shrimp, and seasonings.

TONYU (SOYBEAN "MILK")

The milky liquid obtained by grinding soybeans with water and heating and straining off the insoluble residue has the appearance of skim milk. Early reports from China and from Japan stated that soybean milk may be used as a substitute for cow's milk for children, but Wan

(16, p. 360), in more recent scientific reports from China, indicated that, whereas soybean milk is richer in vitamin B than is cow's milk, soybean milk is lower in vitamin A and still lower in calcium content. The biological value of the protein of the soybean milk is not comparable with that of the protein of cow's milk. Chemical analyses of local soybean milk obtained from the tofu-manufacturing shops showed it to be low in fat and in carbohydrates. Chang and Tso (3, p. 199) demonstrated that, when properly supplemented with the necessary minerals, vitamins, fat, and carbohydrates, soybean milk can be used successfully for infant feeding where cow's milk is not available or where the infant is anaphylactic to the protein of cow's milk. In Hawaii there is no need to use soybean milk as a substitute for cow's milk and, considering its dietary qualities, it should not be so used without the needed supplements.

ABURAGE (FRIED SOYBEAN CURD)

Aburage is prepared in Hawaii as follows: Yellow soybeans are ground with water as in making tofu (see page 3). Half the mass is cooked as described for tofu and mixed with an equal quantity of uncooked ground soybeans. The bean milk is strained off and the protein precipitated as for tofu. This precipitated protein has the appearance of tofu, but after being cooked becomes light in texture, whereas tofu would not be light. The curd is cut in triangles and fried a light brown, usually in rapeseed oil.

Aburage is made at tofu-manufacturing shops, and, as commonly prepared, will keep without refrigeration for 2 days. It is widely used by Japanese usually combined with konnyaku and fresh vegetables and cooked in shoyu. Aburage is often cut to form a small cornucopia and cooked for about 15 minutes in a mixture of shoyu, sugar, and dried shrimp to impart flavor to the aburage. The cornucopia is filled with a mixture of rice, seasoned with salt and with vinegar, and vegetables and fish.

When it is cooked in oil the curd loses water and absorbs the oil, and the resulting food contains more than 20 percent of protein and fat. Only 34 grams, or 1½ triangles of aburage, are necessary to yield 100 calories. This food is not so highly recommended as tofu, because the protein is greatly toughened by frying, and digestibility is doubtless lessened. The product is somewhat like the white of an egg which has been browned in deep fat. The vitamin content is probably negligible, but analyses made in Japan (see Appendix) indicate a high calcium, phosphorus, and iron content.

MISO (FERMENTED RICE AND SOYBEANS)

Miso, a favorite food of the Japanese, is made from koji (see page 9) and soybeans. In 1930, some 308,104 pounds of miso, valued at \$20,-504, were imported into Honolulu from Japan. Several establishments in Honolulu manufacture miso. The common method of manufacture in Hawaii is as follows:

Yellow soybeans are soaked overnight, cooked for 4 hours, then cooled, mixed with proper amounts of koji (fermented rice) and salt.

and ground. The resultant sticky mass is stored in huge wooden vats and left to ferment for about 2 months. The koji contains enzymes of *Aspergillus oryzae* which convert the starch and the protein of the soybeans into such soluble substances as maltose and proteoses.

In the commercial preparation of miso in Hawaii 2,200 pounds of koji, 700 pounds of dried soybeans, and 300 pounds of salt are used with water to produce about 4,000 pounds of the finished product.

Barley may be substituted for rice in making koji, but so far as is known this is not done in Hawaii. Some red miso imported from Japan contain koji made from barley.

Miso may be used alone or in a variety of dishes. It is widely and commonly used in the pickling of such vegetables as eggplant, cucumbers, daikon, (*Raphanus sativus longipinnatus*) and the oriental pickling

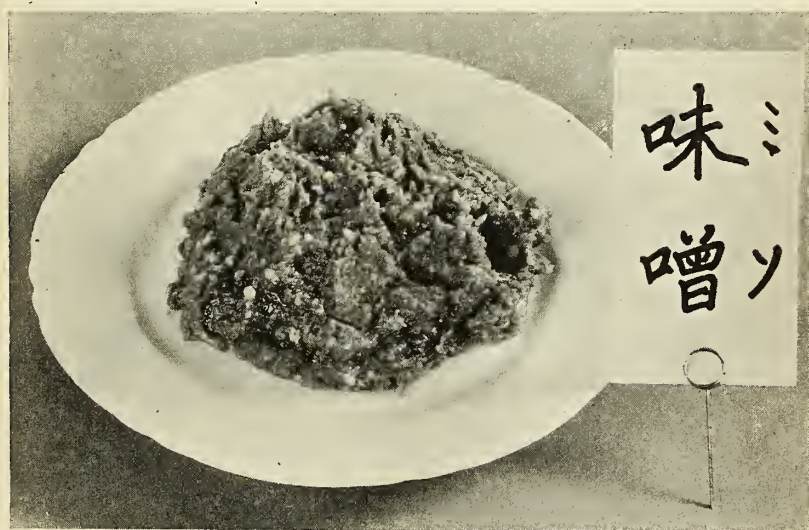


FIGURE 3.—Miso or fermented rice and-soybeans.

melon (*Cucumis melo var. conomon*). Most of the Japanese families in Hawaii who continue to eat Japanese foods use miso every day, usually in the form of soup for breakfast.

As a result of grinding and mixing, and of enzymic action on the carbohydrates and the protein, part of the miso is soluble in water. Most of the rest readily forms a suspension so that when it is ground in a suribachi, mixed with water, and passed through a sieve, the residue consists only of a few coarse particles.

Miso has a rather high nutritive value, only 65 grams, or $3\frac{3}{4}$ tablespoons, of the local product being required to yield 100 calories. Since miso costs less than $1\frac{1}{2}$ cents per 100 calories, it may be considered a relatively cheap food. It is not so good a source of calcium, phosphorus, and iron as are the soybeans, because koji made from polished rice constitutes almost half the mixture. Nevertheless, miso is a better source of iron per unit of weight than are many green vegetables. Saiki (11, p. 294) reports that miso contains no appreciable amount of any of the vitamins.

NATTO (FERMENTED SOYBEANS)

In Honolulu, natto is made as follows: Soybeans are washed and cooked, without being soaked, in a large iron kettle (*kama*) for about 8 hours. The beans are thoroughly drained and placed on paper plates covered with waxed paper. The plates are stacked one above another in large wooden boxes, covered with rice-straw mats, and kept at a temperature of approximately 30° C. for 35 to 36 hours, when the product is ready for use. By this time the soybeans have changed from yellow to dark brown, and have shrunk to about half the size of the freshly cooked beans. The fermented product is covered with a gray, slimy substance that forms strings or threads when the beans are pulled apart, indicating



FIGURE 4.—Natto or fermented soybeans.

good quality. Natto has a peculiar characteristic odor, probably due to changes in the protein resulting from enzymic action.

Although no molds or yeasts are added to the cooked soybeans, O. N. Allen, of the botany department of the University of Hawaii, who examined several samples of fresh natto from Honolulu, found 2 molds, 4 bacteria, and an *aspergillus* present. The enzymes of some of these organisms probably cause the conversion of a small part of the protein to simpler substances. Piper and Morse (*10, p. 244*) in 1923 reported finding peptones and several amino acids in the fermented product.

Natto is a rather concentrated food, only 58 grams, or one third cup, yielding 100 calories. It is a very good source of calcium, phosphorus, and iron. Saiki (*11, p. 291*) reported natto to contain only a small amount of vitamin B.

Japanese coming from the southern part of Honshu and from the western part of Kiushu consider natto to be extremely unpalatable; hence its use has not spread to these regions. Natto is frequently used in some Japanese homes, being usually eaten with rice by mixing the natto with some salt and allowing the mixture to stand for 30 minutes or longer, or by mixing with grated vegetables such as daikon seasoned with shoyu. Natto is also ground and made into soup with or without the addition of leafy vegetables, miso, and bonito.

SHOYU (SOYBEAN SAUCE)

Shoyu, or soy sauce, is a clear, brown liquid used as an essential condiment in Japanese cookery. It has a pleasant aromatic odor, and a peculiar taste. Shoyu contains considerable sodium chloride and dishes in which it is used require no additional salt.

The method of manufacture is given in detail by Piper and Morse (10, p. 250) and by Oshima (8, p. 31), and only briefly here. In Hawaii soybeans are cooked as described for natto, and after having cooled are added to wheat or to barley that has been roasted and coarsely ground. To this mixture is added what the Hawaiian manufacturers call "shoyu yeast," which probably consists essentially of spores of *Aspergillus oryzae*, but does not resemble in appearance the product used in the making of koji from rice. (See below.) The mass is then placed on small trays and left in a warm room for 2 days to promote the growth of the fungus, the enzymes of which act on the carbohydrate and the protein. The mass is then transferred to large vats, mixed with salted water, and allowed to stand for 6 months or longer, being stirred daily. Usually it is thought that the longer the period of fermentation the finer the quality of the shoyu. Oshima (8, p. 32) reported that in Japan shoyu is allowed to ferment for as long as 5 years, but in Hawaii the process is usually not longer than 6 months. When the fermentation process is completed the mixture is taken from the vats and placed in bags, and the liquid is expressed under pressure. The liquid constituting the shoyu is boiled enough to sterilize it and then put in barrels or in bottles for the market.

KOJI (FERMENTED RICE)

Koji, or fermented rice, is one of the principal ingredients of miso, and is also used in preparing vinegar and shoyu, in pickling vegetables, and in making alcoholic beverages. Koji is usually prepared in Hawaii as follows:

Several hundred pounds of rice are cooked by forcing steam into a large wooden tub containing the rice. The steamed rice is not sticky, the mass seems to be only slightly moist, and each grain retains its shape. The cooked rice is spread on mats and cooled to approximately 30° C. Dry spores of *Aspergillus oryzae*, obtained in tins from Japan, are then mixed with the rice. It is placed in large wooden boxes, each containing several hundred pounds, and kept in a warm room for 15 hours. The temperature of the rice varies from 33° to 42°. The temperature of the mixture rises as the enzymic action increases so that at the end of 15 hours it is necessary to shift the rice on to small trays, each of which holds about 5 pounds. Here it is left for another 15 hours. At the end of this period the rice is spread on large trays made by placing mats over wire, and allowed to stand until it is dry and enzymic action is arrested. Koji is sold as such or is used in making other food products.

Aspergillus oryzae contains a great many enzymes, such as diastase, invertase, lactase, lipase, maltase, protease, amidase, and less common

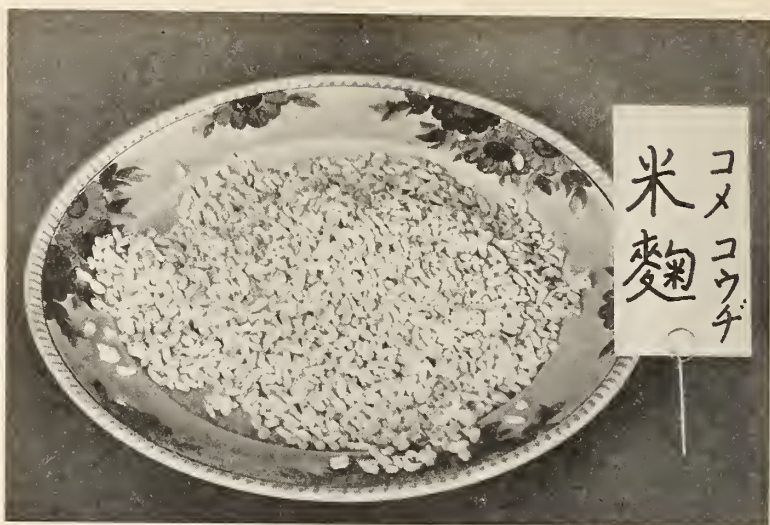


FIGURE 5.—Koji or fermented rice.

enzymes. As a result of the action of some of these enzymes the koji has a sweet taste, owing to the formation of sugars from part of the starch.

Inasmuch as koji is made from polished rice, its food value is practically the same as that of rice, except for soluble carbohydrates. Koji is low in minerals and in vitamins.

KONNYAKU

Konnyaku flour is made from the tuber of *Amorphophallus konjac* and is imported into Hawaii from Japan. Konnyaku is usually made in Hawaii as follows:

Into 2 pounds of konnyaku flour 7 to 8 gallons of water are gradually stirred until the mass becomes soft, uniform, and gelatinous and has the consistency of about 2 finger poi. After 15 minutes the mass is stirred again, and allowed to stand until limewater, made by thoroughly mixing approximately 1 to 1½ cups of lime with about 2 quarts of water, is added. The limewater is passed through a bamboo strainer and added slowly with thorough mixing to the gelatinous mass until the latter thickens. The mass is then poured out on trays and after setting is cut in 4-inch squares about three fourths of an inch thick and boiled in water for 20 minutes. It is allowed to cool in the water in which it was cooked, and if left in this water will keep almost indefinitely. After the limewater is added konnyaku may be pressed through sieves to form fine strips resembling noodles. It is then boiled. Usually this form is used for hekka.⁴

Konnyaku is commonly eaten by Japanese once or twice a week.

⁴ Hekka is a general Japanese term for dishes made of meat, such as beef or chicken, with various vegetables seasoned with shoyu and sugar, to which may be added tofu, konnyaku, egg, etc.



FIGURE 6.—Konnyaku.

Usually, it is cooked with shoyu, sugar, and bonito, or with dried shrimp, and often it is combined with tofu and vegetables.

Konnyaku usually contains over 95 percent of water and therefore is low in nutritive value. Oshima (8, p. 35) reported that konnyaku contains no starch, its carbohydrates (3 percent) being mannan. Since mannans are not well utilized by the body, the nutritive value of the mannan in the tuber is doubtful. Because of the lime used in making it, konnyaku is high in calcium. So far as it is known, no experiments have been made to show how well the calcium is utilized by the body. Konnyaku has not been studied for its vitamin value, and is not a likely source of any.

In Hawaii three cakes, weighing approximately a pound, sell for 5 cents. The individual cakes range in weight from 145 to 170 grams. Approximately 807 grams, or about five cakes, will yield 100 calories, assuming that all the carbohydrates are utilized.

UMEBOSHI (RED-PICKLED PLUMS)

Salt pickled plums (*Prunus mume*) colored red are always found even in the smallest Japanese food stores and are used by Japanese especially as a relish with rice. Umeboshi are imported from Japan in rather large quantities, 158,800 pounds, valued at \$5,460, having been imported in 1932. The method of salting and curing as reported from Japan⁵ is as follows:

The green plums are washed and placed in wooden barrels with water to cover and allowed to stand overnight. They are then drained in bamboo baskets, placed in wooden barrels in alternate layers with salt and aka shiso or perilla (*Perilla frutescens nankinensis*), and allowed to stand for about 3 weeks. The plums and the perilla are then removed from the barrel and spread in a single layer on bamboo racks

⁵ Personal communication from Mrs. Toshiyo Kihara, of the nutrition department of the home economics laboratory, Japan Women's University, Tokyo.

to dry in the sun for 2 days. They are replaced in the brine for 2 days and then again dried in the sun for 2 days. The drying process is repeated 6 or 7 times or until the surface of the dried product becomes wrinkled and incrustated with fine salt particles. The plums are returned to the brine, which has been colored red by the perilla. Umeboshi are imported into Hawaii in this brine in small barrels. Analyses by Saiki and coworkers (12, p. 220, 221) show that umeboshi are low in nutritive value and contain a large amount of salt. Vitamin investigations by Shimoda and coworkers (14, p. 354, 355) showed the plums to be practically devoid of vitamins A, B, and C.



FIGURE 7.—Umeboshi or red-pickled plums.

A traditional Japanese custom is to serve, as a good omen, umeboshi with a cup of tea to someone about to make a journey. Umeboshi and tea are always served before breakfast at the Japanese New Year. Rice water or very soft-cooked rice and umeboshi are served to persons who are not well.

HUKUSAI (PICKLED LEAF CABBAGE)

Chinese, or white-mustard cabbage (*Brassica chinensis*), is one of the favorite vegetables of the Japanese. It may be wilted with a little hot oil, and shoyu, vinegar, and sugar may be used for seasoning, with or without the addition of a small quantity of fish, pork, or shrimp. Chinese cabbage is also used in making soup with pork and fish. The cabbage is widely used in the pickled state. It is prepared in the home as follows:

Bunches of cabbage are washed and placed outdoors to wilt, after which layers of it are spread in a shoyu tub or other container, salt is sprinkled over each layer, and a little water is added; or the cabbage may be mixed with a paste made of rice bran, salt, and water, and allowed to stand for 2 to 7 days, according to individual taste. Before

it is used the cabbage should be washed thoroughly to remove excess salt and the rice bran. It is then seasoned with shoyu and eaten with rice.

Results of investigations in the nutrition laboratory of the Hawaii Agricultural Experiment Station (18) show that the cabbage, when pickled with salt only, loses almost 50 percent of the original vitamin B content, whereas cabbage pickled in a paste of salt and rice bran has its vitamin B content increased to almost four times the original value,



FIGURE 8.—Hukusai or pickled-leaf cabbage.

apparently as the result of absorption of this vitamin by the plant tissue. Rice polish or rice bran therefore should always be used in salting leaf cabbage.

AJINOMOTO

Ajinomoto is an important food condiment much used by Japanese. According to Han (6, p. 984), it consists largely of monosodium glutamate, that is, the sodium salt of one of the amino acids.

The Japanese chemists Ikeda and Suzuki first patented a process



FIGURE 9.—Fresh mustard cabbage.

for making this product in Japan in 1908. Four years later they obtained a patent in the United States. Modifications of the original process of manufacture have been made from time to time both in China and in Japan, but it consists essentially in the hydrolysis of vegetable or of animal protein with acid or alkali to form amino acids and salts or esters of the acids, followed by purification of the product. In very dilute solutions monosodium glutamate and the esters of the amino acids have a decided meatlike flavor.

In Hawaii ajinomoto is sold in the powdered form for 25 cents an ounce, and actually ranges in price from \$3 to \$4 a pound, according to the size of the package. The extent of the manufacture of ajinomoto and similar products is indicated by the report by Han (6, p. 984) that in 1928 "the Chinese alone used \$1,130,000 worth of this chemical condiment."

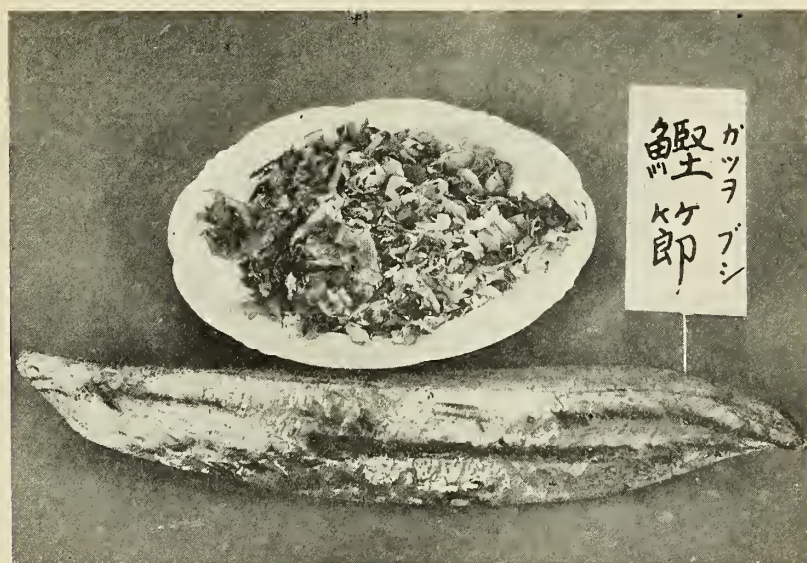


FIGURE 10.—Katsuo-bushi or dried bonito.

KATSUO-BUSHI (DRIED BONITO)

The dried flesh of bonito (*Sarda chilensis*), which may be bought in the form of either paper thin flakes or "bonito sticks," is an important food adjunct in the Japanese dietary. Part of the product used locally is imported from Japan, and some "bonito sticks" are made in Honolulu. The product is prepared by boiling the fresh bonito in water and by drying, without salt and with or without smoking, until its water content is so low that it can be kept easily without spoiling. Thin slices are cut from the bonito stick as needed, and like the flakes may be used for soup stock or for incorporation into the food as such. The flavor imparted by bonito to the various food mixtures is especially liked by Japanese. The food value is similar to that of any other dried fish low in fat, and supplies protein and flavor to the diet.

The price of bonito varies with the quality. As a source of protein it is a relatively expensive food. The bonito stick shown in figure 13 cost 35 cents and weighed 192 grams. Some of the outside of the stick would have to be discarded before it is used. Only small quantities, however, are used in making Japanese dishes, the flavor which it imparts being more important than the protein it supplies.

IRIKO (SMALL DRIED FISH)

Three kinds of small dried fish, usually called iriko, are commonly used by the Japanese to impart flavor to food and to make soup stock. The smallest fish, called chirimen-iriko, are approximately three fourths of an inch long and of creamy white color. They are crisped by heat-



FIGURE 11.—Iriko or small dried fish.

ing in a pan over the fire or softened by pouring hot water over them. They are eaten with shoyu and rice. The medium-sized fish, called chuba-iriko, are about $1\frac{1}{4}$ inches long. The largest fish, called oba-iriko, are 2 to $2\frac{1}{2}$ inches long. The last two kinds are of a silvery gray color and are used for soup stock, or are cooked with vegetables to impart flavor; the fish is then usually discarded.

KAISO-RUI (SEAWEEDS)

The Japanese use many algae or seaweeds in a great variety of preparations. The seaweeds most commonly used in Hawaii are kanten, wakame, kombu, and nori, all of which are imported in the dry state from Japan. The percentage composition of these algae does not give a true indication of their nutritive value inasmuch as the material reported as carbohydrate is not starch nor any of the common food sugars, nor is the material reported as protein on the basis of nitrogen analyses, material that can be utilized by the body to any extent.

No recent work on the digestibility of the nitrogenous and carbohydrate material is available, but Oshima (*8, p. 199*) in 1905 reported the average coefficient of digestibility for the carbohydrates of marine algae used by the Japanese as 67.7 percent, whereas the carbohydrates of rice have a digestibility of 98 or 99 percent.

Algae are largely of value in furnishing flavor, iodine, and inorganic salts to the diet and in acting as a laxative. Saiki and coworkers (*12, p. 224, 225*) recently reported that the commonly used algae are excellent sources of calcium, phosphorus, and iron. How well these minerals are utilized is not known. In view of the poor utilization of

both carbohydrates and nitrogen, one is scarcely justified in assuming that the minerals are well utilized until they are proved to be. Reports as to the vitamin content of seaweeds vary considerably. Some investigators (5; 7; 14, p. 350) report a high vitamin A content for green algae and a fair amount of vitamin B. Seaweeds have no demonstrable quantity of vitamin C.

KOMBU.

Kombu is the general Japanese name for seaweed preparations made from members of the kelp family (*Laminariaceae*). Two types are commonly used in Hawaii. The large coarse leaves are used for stock, which is made by soaking the leaves in water and boiling them for several hours. This stock is used as a basis for soup and other dishes, the kombu being discarded. The smaller fronds are soaked and cooked and are eaten in combination with vegetables, meat, or fish.

Kombu roll is made by wrapping kombu around fried or salted fish and cooking the whole in a small amount of water to which shoyu is added before the cooking is complete. The kombu is eaten with the fish.



FIGURE 12.—Kombu.

WAKAME

Wakame (*Undaria pinnatifida*) is one of the favorite algae of the Japanese in Hawaii. It is used in soup and is itself eaten. It may be soaked, cut in pieces, and mixed with cucumber and miso-vinegar sauce. Green onions cut in $1\frac{1}{2}$ inch lengths may be boiled for a few minutes and mixed with wakame and miso-vinegar sauce.



FIGURE 13.—Wakame.

KANTEN

Kanten is prepared from several kinds of seaweeds, the most important being *Gelidium corneum*, from which the best grade of kanten is made. Kanten is found on the market in the form of kanten sticks, 1 by 1 by 10 inches, and is usually of either white or red color. Kanten is nothing more than agar-agar in a relatively pure state. It is used by the Japanese in preparing a variety of dishes, including confections, in the same way that gelatin is used.



FIGURE 14.—Kanten.

NORI

Nori is a common general term for seaweed preparations from several species of *Porphyra* or laver. The dried material bought on the Hawaii markets is shipped in from Japan in bundles of flat sheets which are about $7\frac{1}{2}$ by $8\frac{1}{2}$ inches and as thin and flexible as tissue paper. These sheets are made by chopping the fronds of fresh algae that are spread upon mats to dry. The sheets are then made into bundles for the market. The purplish-red nori is the one most commonly used in Hawaii, the green nori being more expensive.

Nori is used to garnish sushi, salads, noodles, raw fish, and eggs, and is always eaten. It is used in the preparation of maki-sushi by wrapping it around a roll of rice the center of which is filled with thin strips of fried eggs, kampo, (p. 23) roasted eel, green vegetables, mushrooms, and the like (fig. 15). Strips of green nori are made crisp by passing them over a flame or over hot charcoal. They are eaten with shoyu and rice.



FIGURE 15.—Nori used for maki-sushi.

UDON AND SOMEN (JAPANESE NOODLES)

Japanese noodles are made of wheat flour kneaded with salted water. The dough is mechanically rolled into thin sheets. These are cut into long, narrow strips, and dried. The strips are then cut in 8-inch lengths, tied in small bundles, and packed in boxes for the market.

The very fine noodles, made in narrow strips, are called somen. Wide noodles like those shown in figure 16 are called udon. The word "saimen" is from the Chinese and is used by the Japanese to mean noodles made with flour, soda, salt, egg, and water. The word "saimen"

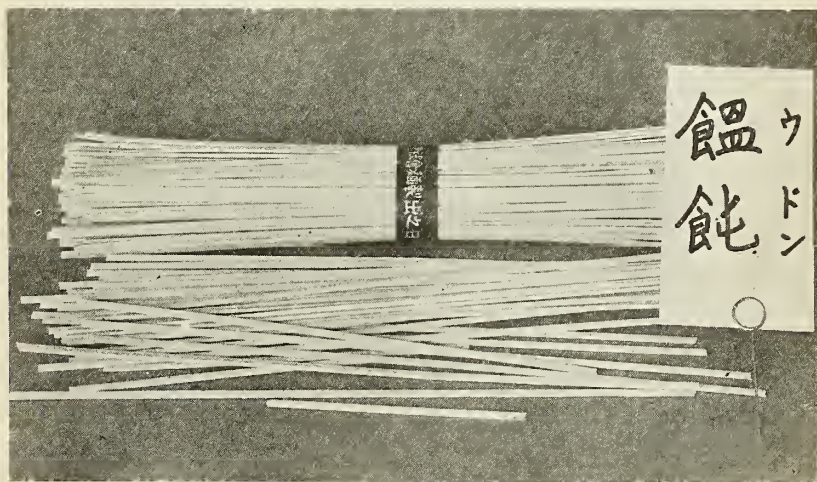


FIGURE 16.—Udon or Japanese noodles.

is frequently seen on the signs of small food shops and on wagons from which noodles are sold. Noodles made with water only have a food value similar to that of white flour. About 31 grams of the dry noodles, or 130 grams or two thirds of a cup of cooked noodles, will yield 100 calories.

KAMABOKO (FISH CAKE)

Kamaboko is a general name for a food product made of fish and some other ingredients. Any kind of fish with white flesh may be used for the purpose. The Hawaiian swordfish, a'u (*Xiphias gladius*), is commonly used in Hawaii for making kamaboko, but the shark also is used. The skin and the bones are carefully removed from the fish. The flesh is chopped and passed through a meat grinder. After it is well ground a mixture of cornstarch, sugar, salt, and ajinomoto is added with enough ice water to give the consistency of thick poi. The ice water keeps the temperature down and thus prevents the mixture from spoiling rapidly. It is then molded into various shapes and cooked by steaming or by broiling, after which it is ready for the market. It

may be molded on boards, larger pieces on boards 2 by 7 inches, and smaller pieces on boards $1\frac{1}{4}$ by 5 inches. The pieces are then steamed or broiled for about 15 to 20 minutes. The thick mixture is sometimes pressed around a small bamboo stick and cooked. Both this type and that of a fish cake on a board are shown in figure 17. The surface of kamaboko often is artificially colored, especially with green or with pink to give it an attractive appearance.

Three establishments in Honolulu manufacture kamaboko. One manufacturer reported that about 4,000 pieces of fish cake are made daily in Honolulu. The pieces range in weight from 3 to 8 ounces.



FIGURE 17.—Kamaboko or fish cake.

Kamaboko may be kept without refrigeration for 3 days and with refrigeration for 1 month. It may be eaten either in the fresh state or cooked with shoyu and sugar. It is also used in salad, soup, Japanese custard, and vegetable dishes. Kamaboko, made in fancy shapes of varied colors, is always used on such festival occasions as birthdays and the New Year.

In Japan many persons consider kamaboko to be a luxury, but in Hawaii it is generally used by all classes. It is an expensive food, however, 109 grams yielding only 100 calories. Each of the two pieces of kamaboko shown in figure 20 is a 100-calorie portion and costs 10 cents. The food value is due largely to the protein of the fish used in making it. Obviously, kamaboko is an expensive source of protein. Where money for food is limited it would be unwise to buy kamaboko when for the same expenditure so much more food value could be obtained from the cheaper cuts of meat and fish.

KAMPYO (STRIPS OF DRIED, EDIBLE GOURD)

Kampyo is made from a gourd (*Lagenaria vulgaris*) by discarding the skin and the seeds and by cutting the edible portion into long, thin strips that are dried in the sun. It has a sweet taste, a rather distinctive flavor, and is considered essential for certain favorite dishes, such as maki-sushi. The composition of kampyo indicates a high protein and carbohydrate content, but the small quantity ordinarily used makes the food value of slight importance.

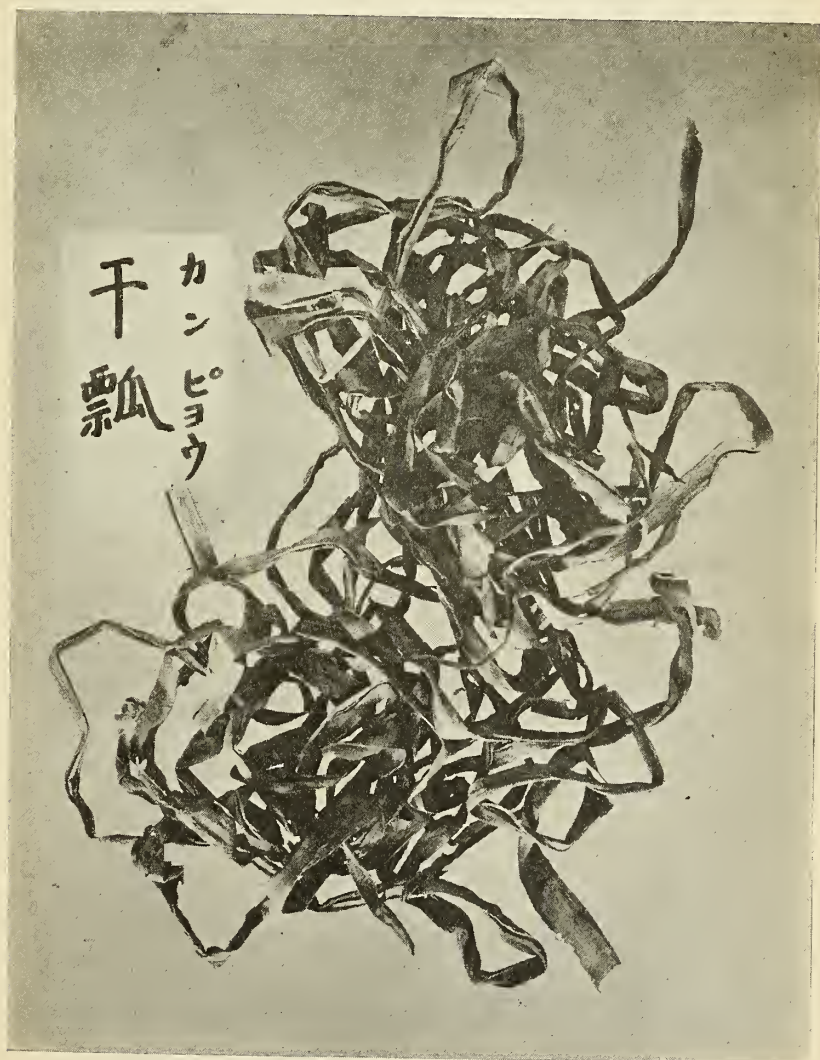


FIGURE 18.—Kampyo or strips of dried edible gourd.

KINOKO (MUSHROOMS)

Dried mushrooms are frequently used in the preparation of Japanese dishes, but perhaps not so extensively as in the preparation of Chinese foods. Large quantities of dried mushrooms are imported from Japan and from China, 103,518 pounds having been imported in 1930. Several varieties are used by the Japanese, including the common dried shiitake (*Cortinellus shiitake*), and matsutake (*Armillaria matsutake*) which come from Japan in tins.

• Although the percentage composition of dried mushrooms indicates a high nutritive value, they are high in water and relatively low in food



FIGURE 19.—Kinoko or mushrooms.

value after having been soaked and cooked. Clark, in Atkinson's book on mushrooms (2, p. 292), shows that the protein content as indicated by multiplying the percentage of nitrogen by the factor 6.25 is misleading, because probably only a small part of the total nitrogen is utilized by the body. Smith (15, p. 9) reports vitamin studies by several investigators who found that mushrooms contain some vitamin B, but not appreciable amounts of the other vitamins.

FU (GLUTEN CAKES)

Fu is a crackerlike substance of very light and delicate texture made from wheat gluten and varying smaller quantities of glutinous rice flour and wheat flour. All the fu used in Hawaii comes from Japan, 98,623 pounds, valued at \$17,259, having been imported in 1932.

The method of making fu as reported from Japan⁶ is as follows: Raw fu is made by mixing wheat flour with a weak salt solution to

⁶ Personal communication from Mrs. Toshiyo Kihara, of the nutrition department of the home economics laboratory, Japan Women's University, Tokyo.

form a dough, and then washing out the starch, leaving a sticky mass of wheat protein. To 100 parts by weight of raw fu, 10 to 15 parts of glutinous rice flour and 30 to 100 parts of wheat flour are mixed according to the variety of fu desired. It is molded into a variety of shapes characteristic of the different kinds of fu, and is baked in an oven for 15 minutes. Sometimes a seaweed like nori is folded into the fu. (figure 20).

Some of the varieties of fu are kuruma (wheat), kiri (sliced), giyanome (dragon's eye), and chiyomei (longevity). Kingyo fu is a common goldfish food.



FIGURE 20.—Fu or gluten cakes.

Fu varies in composition according to the amount of other flours added to the wheat gluten, but the average composition given in table 1 (Appendix) shows it to be high in protein, over 30 percent, as compared with most other kinds of crackers and cakes. Fu is low in minerals and has no vitamins. It is so light in weight as to require the use of 28 grams, or 25 pieces like those shown in figure 23, to yield 100 calories. Before it is used, fu is always soaked in water and the water squeezed out by hand. After the soaking and squeezing process, fu may be added to hot miso soup or to cooked vegetables.

.. GOMA (SESAME SEEDS)

Sesame seeds are much prized for the flavor they impart to food. Both the black and the white seeds, called, respectively, kurogoma and shirogoma, are used. They have essentially the same composition, random samples of each varying in their carbohydrate and fat content. Saiki and coworkers (12, p. 230, 231) give the composition of four samples that range from 43 to 54 percent in their fat content. They

have a high caloric value, but ordinarily are used in such small quantities as not to add greatly to the energy value of the foods with which they are combined.

Saiki's analyses (12) of whole sesame seeds show the amounts of calcium, phosphorus, and iron to be very high compared with other foods. If the body utilizes well the minerals of sesame seeds, they should be excellent sources of these three minerals, especially calcium.

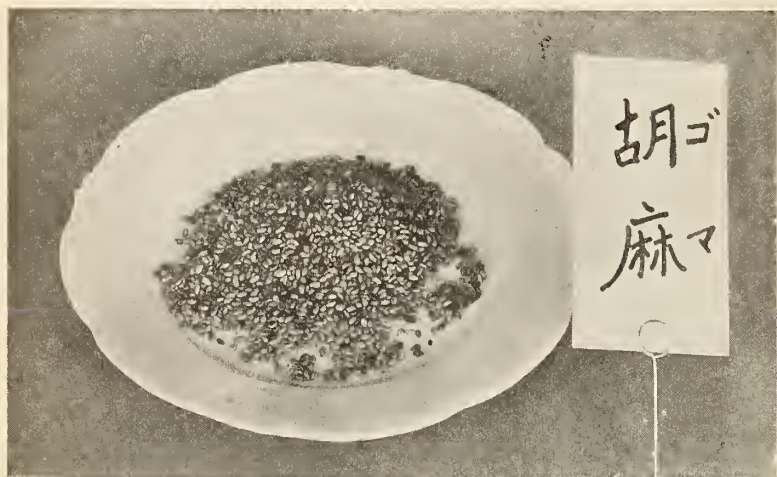


FIGURE 21.—Goma or sesame seeds.

Before being combined with food the seeds are always roasted by being stirred in a frying pan or in a kettle over a fire for a few minutes. Their uses are many. They may be combined with salt and sprinkled over rice; or they may be ground with sugar and shoyu and eaten with pounded rice cake (mochi). They are added to miso sauce, fried miso, pickled vegetables, candies, shirai, and in a shoyu-vinegar sauce are added to vegetables.

OILS USED IN COOKING

The common food oils used by the Japanese are rapeseed oil and sesame-seed oil. Peanut oil is used less extensively. Rapeseed oil sells in Honolulu for about the same price as does refined cottonseed oil. Sesame-seed oil is somewhat higher in price. Like all highly refined vegetable oils, they are practically, if not completely, devoid of vitamins.

RECIPES ⁷

The following recipes are typical of those used by the Japanese in Hawaii. Included also are recipes for miso soup made with milk in the hope that this will be a means of introducing milk into the dietary of persons who do not take milk in the usual forms. The flavor of miso soup made with milk is similar to that made with bonito or with kombu stock.

The cooking utensils shown in figure 25 are found in every Japanese kitchen.

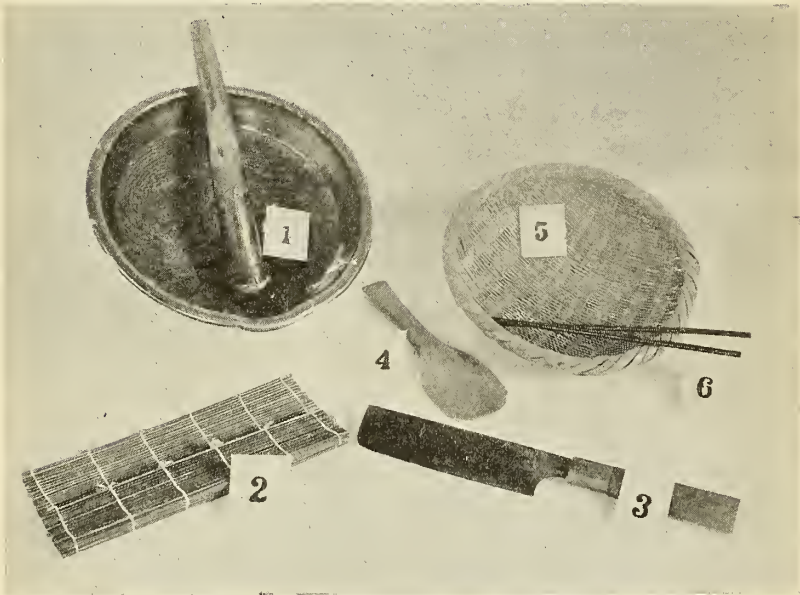


FIGURE 25.—Japanese kitchen utensils; 1, Suribachi (bowl with corrugations and wooden pestle for grinding miso); 2, su (bamboo mat for making maki-sushi); 3, hocho (knife); 4, shiyamoji (wooden paddle used for mixing); 5, zaru (bamboo strainer); 6, hashi (chopsticks).

⁷ For information regarding some of the vegetables mentioned in the following recipes, the reader is referred to the bulletin of Chung and Ripperton (4). The data on composition of foods used for calculating the caloric value of the ingredients have been taken from table 1 and from the references listed under Literature Cited (page 40), with the exception of some common foods as lemons, carrots, string beans, sugar, and fat, which have been taken from Sherman's Food Products (13).

MISO SOUP WITH TOFU

The ingredients required for miso soup with tofu are iriko, water, miso, tofu, and green onions.

Wash the iriko, add the water, bring to the boiling point and let simmer for 15 minutes. Discard the iriko. Put the miso in a bamboo strainer, add iriko stock a little at a time, and stir until all the miso is pressed out. Cut tofu in half-inch cubes and add to the stock. Gradually bring to the boiling point, then remove from the fire. Add finely chopped green onions and serve. Since prolonged heating destroys the mild flavor of miso, all dishes containing it should be cooked only long enough to bring them to the boiling point.

TABLE 2.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in miso soup with tofu for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories	
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
Iriko.....	1 cup	60	2.1	.....	.....	.....	.....	.....	.....	.....
Water.....	6 cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miso.....	$\frac{3}{4}$ cup	210	7.4	325	55	35	235	.....	.....	.....
Tofu.....	$\frac{3}{4}$ cube	390	13.7	307	140	142	25	.....	.....	.....
Green onions.....	$\frac{3}{8}$ cup	30	1.1	7	2	1	4	.....	.....	.....
Product.....	$7\frac{1}{2}$ cups	715	60.6	639	197	178	264	270	9.5	$1\frac{1}{4}$	

1 For soup stock only.

MISO SOUP WITH WAKAME

The ingredients required for miso soup with wakame are iriko, water, miso, and wakame.

Prepare stock from iriko and add miso, as in former recipe. Cover the wakame with water, soak for 10 minutes, remove it from water and cut in 1-inch lengths. Add the wakame to the stock, bring gradually to the boiling point, boil for 3 to 5 minutes, then remove from the fire.

TABLE 3.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in miso soup with wakame for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories	
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
Iriko 1.....	1	60	2.1	.....	.....	.....	.....	.....	.....	.....
Water.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miso.....	$\frac{3}{4}$	210	7.4	325	55	35	235	.....	.....	.....
Wakame.....	$\frac{1}{3}$	12	4	27	5	2	20	.....	.....	.....
Product.....	$6\frac{1}{2}$	1,224	43.0	352	60	37	255	346	12.2	$1\frac{7}{8}$	

1 For soup stock only.

MISO SOUP WITH DAIKON

The ingredients required for miso soup with daikon are iriko, water, miso, daikon, and green onions.

Prepare soup stock from iriko and add miso as in the recipe for miso soup with tofu (page 28). Cut the daikon in very thin strips 2 inches long, and add them to the stock. Bring the stock gradually to the boiling point and simmer gently until the daikon is tender. Remove from the fire, add finely cut green onions, and serve. The daikon may be grated and added to the boiling stock and the whole immediately removed from the fire.

TABLE 4.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in miso soup with daikon for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories	
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
Iriko 1.....	1 cup	60	2.1	.....	.....	.....	.....	.....	.....
Water.....	6 cups	.....	.....	.....	.....	.....	.....	.....	.....
Miso.....	¾ cups	210	7.4	325	55	35	235	.....	.....
Daikon.....	2 cups	270	9.5	30	6	7	17	.....	.....
Green onions.....	3 tablespoons	21	.7	4	1	1	2	.....	.....
Product.....	5½ cups	1,164	41.0	359	62	43	254	324	11.4	1½	

1 For soup stock only.

MISO SOUP WITH MILK

The ingredients required for miso soup with milk are miso, milk, and tender tips of watercress.

Heat the milk almost to boiling, add to miso, and put through a strainer. Pour boiling water over the watercress and let it stand for 1 minute; then drain and add to the milk and miso mixture. Serve.

The milk and miso mixture will curdle if it is allowed to boil.

Evaporated milk may be used instead of fresh milk, in which case the water for dilution may be stock made with bonito, kombu, or iriko. Other vegetables such as daikon, or wakame, may be used instead of watercress, and tofu may be added as directed for miso soup with tofu (page 28).

TABLE 5.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in miso soup with milk for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories	
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
Miso.....	1 cup	280	9.2	431	74	47	310	.....	.....	.....
Milk.....	5 cups	1,150	40.5	796	152	414	230	.....	.....	.....
Watercress.....	20 tips	50	1.8	7	4	.....	3	.....	.....	.....
Product.....	6¼ cups	1,500	50.9	1,234	230	461	543	122	4.3	½	

TOFU SOUP WITH LEMON

The ingredients required for tofu soup with lemon are fish (aku, opakapaka, or any fresh fish), water, watercress, lemon juice, lemon rind, salt, and tofu.

Cut the fish in half-inch cubes, place them in boiling salted water and boil for 10 to 15 minutes. Add finely cut watercress, lemon juice, lemon rind, and tofu cut in half-inch cubes. Bring to the boiling point and serve.

TABLE 6.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in tofu soup with lemon for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces	
		Grams	Ounces							
Fish.....	1 ¼ cups	178	6.3	216	132	84	.....	.....	.....	.....
Water.....	5 ¼ cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Watercress.....	3 ¼ cups	115	4.1	16	9	1	6	.....	.....	.....
Lemon juice.....	1 ¼ teaspoons	12	.4	5	.....	.....	5	.....	.....	.....
Lemon rind.....	¼ lemon	10	.3	.....	.....	.....	.....	.....	.....	.....
Salt.....	2 ½ teaspoons	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tofu.....	1 cube	425	14.8	335	153	155	27	.....	.....	.....
Product.....	6 ½ cups	1,900	67.0	572	294	240	38	332	11.7	1 ¾

TOFU SHOYU SOUP

The ingredients required for tofu shoyu soup are bonito, water, tofu, shoyu, salt, and green onions.

Add water to the bonito, let simmer gently for 15 minutes, strain, and discard the bonito. Add ½ inch cubes of tofu, and shoyu and salt to the stock. Bring it to the boiling point, add finely cut green onions, and serve hot.

TABLE 7.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in tofu shoyu soup for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces	
		Grams	Ounces							
Bonito 1.....	1 cup	16	0.6	.....	.....	.....	.....	.....	.....	.....
Water.....	6 ¼ cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tofu.....	1 cube	425	14.8	334	153	155	26	.....	.....	.....
Shoyu.....	¾ cup	140	5.0	71	43	.....	28	.....	.....	.....
Salt.....	½ teaspoon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Green onions.....	1 ¼ cups	100	3.5	23	6	4	13	.....	.....	.....
Product.....	7 ½ cups	1,700	59.9	428	202	159	67	398	14.1	1 ¾

1 For soup stock only.

STRING BEAN SHIRAI

The ingredients required for string bean shirai are string beans, water, sugar, salt, miso, and tofu.

Cut the string beans in 2-inch lengths and cook them with water, sugar, and salt until they are tender and the water evaporates. Cool. Make a paste of miso and tofu by grinding them in a suribachi, or put them through a wire strainer and mix with the string beans. The Japanese always serve shirai cold. Some may prefer to add the miso and tofu paste to the hot vegetables and serve.

TABLE 8.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in string bean shirai for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate			
					Grams	Ounces	Grams				Ounces	Cups
String beans.....	3 cups	330	11.7	137	30	9	98	.....	.....	.....
Water.....	$\frac{3}{4}$ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sugar.....	$1\frac{1}{2}$ teaspoons	6	.2	24	.....	.....	24	.....	.....	.....
Salt.....	$\frac{1}{2}$ teaspoon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miso.....	$4\frac{1}{2}$ tablespoons	81	2.8	125	21	13	91	.....	.....	.....
Tofu.....	$\frac{3}{8}$ cube	195	6.9	153	70	71	12	.....	.....	.....
Product.....	3 cups	498	17.6	439	121	93	225	113	4.0	$\frac{2}{3}$

CARROT SHIRAI

The ingredients required for carrot shirai are carrots, water, sugar, shoyu, tofu, and miso.

Cut the carrots in long, thin strips, add water and sugar, and cook until they are tender and the water evaporates. Add shoyu and cook the whole until the shoyu is absorbed. Cool. Make a paste of miso and tofu by grinding them in a suribachi, or put them through a wire strainer and mix with the carrots.

The Japanese always serve shirai cold. Others may prefer to add the miso and tofu paste to the hot vegetables and serve.

TABLE 9.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in carrot shirai for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate			
					Grams	Ounces	Grams				Ounces	Cups
Carrots.....	3 large	342	12.1	154	15	12	127	.....	.....	.....
Water.....	$\frac{3}{8}$ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sugar.....	2 tablespoons	24	.8	96	.....	.....	96	.....	.....	.....
Shoyu.....	3 tablespoons	42	1.5	21	13	.....	8	.....	.....	.....
Tofu.....	$\frac{3}{8}$ cube	195	6.9	153	70	71	12	.....	.....	.....
Miso.....	$4\frac{1}{2}$ tablespoons	81	2.8	125	21	13	91	.....	.....	.....
Product.....	$2\frac{1}{2}$ cups	555	19.6	549	119	96	334	100	3.5	$\frac{1}{2}$

KONNYAKU SHIRAI

The ingredients required for konnyaku shirai are konnyaku, water, sugar, shoyu, and miso.

Cut the konnyaku in small strips 2 inches long, parboil them in water for 5 minutes and drain. Add sugar and shoyu to the konnyaku and cook without covering until the shoyu is absorbed. Cool. Make a paste of miso and tofu by grinding them in a suribachi, or put them through a wire strainer and mix with the konnyaku. Serve cold.

TABLE 10.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in konnyaku shirai for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
		Grams	Ounces							
Konnyaku.....	3 cups	570	20.1	71	2	.....	69	.....	.....	.....
Water.....	3 cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sugar.....	3 tablespoons	36	1.3	144	.....	.....	144	.....	.....	.....
Shoyu.....	3 tablespoons	42	1.5	21	13	.....	8	.....	.....	.....
Tofu.....	$\frac{3}{8}$ cube	195	6.9	153	70	71	12	.....	.....	.....
Miso.....	4½ tablespoons	81	2.8	125	21	13	91	.....	.....	.....
Product.....	3 cups	651	23.0	514	106	84	324	127	4.5	½

EGGPLANT WITH MISO

The ingredients required for this dish are eggplant, fat, water, dried bonito, miso, and sugar.

Cut the eggplant in ½-inch cubes, add fat and water, and cook with little or no stirring until the vegetable is tender. Press miso through a wire sieve, or rub in a suribachi, add dried bonito, sugar, and water to make a sauce; heat, add to eggplant, and mix lightly. Serve hot or cold.

TABLE 11.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in eggplant with miso for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
		Grams	Ounces							
Eggplant.....	7½ cups	645	22.8	144	34	12	98	.....	.....	.....
Fat.....	1 tablespoon	14	.5	126	.....	126	.....	.....	.....	.....
Water.....	$\frac{3}{4}$ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dried bonito.....	$\frac{3}{8}$ cup	6	.2	18	18	.....	.....	.....	.....	.....
Miso.....	$\frac{3}{4}$ cup	216	7.7	332	56	36	240	.....	.....	.....
Sugar.....	1½ teaspoons	6	.2	24	.....	.....	24	.....	.....	.....
Product.....	4 cups	940	33.2	644	108	174	362	145	5.1	$\frac{2}{3}$

SESAME-SEED SAUCE FOR VEGETABLES

Remove foreign matter from the seeds and wash and dry them. Put them in a frying pan or in a kettle; heat, and stir constantly until the seeds crackle. To break the hulls crush the seeds in a suribachi, or in a bowl or pan, by means of a wooden potato masher. Add sugar, shoyu, and vinegar. Mix with some vegetable and serve.

Some of the favorite vegetables used by the Japanese are boiled white-mustard cabbage, salted white-mustard cabbage, cooked bean sprouts, cooked string beans, fresh diced cucumber, and watercress that has been dipped in boiling water. Some prefer to make the sauce as suggested above but without vinegar, or of sesame seeds, shoyu, and salt. A sauce of miso and sesame seeds is also used for vegetables.

TABLE 14.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in sesame-seed sauce.*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces	
		Grams	Ounces							
Sesame seeds.....	4 tablespoons	28	1.0	146	22	114	10	.....	.....	.....
Sugar.....	2 tablespoons	24	.8	96	.....	.....	96	.....	.....	.....
Shoyu.....	2 tablespoons	28	1.0	15	9	.....	6	.....	.....	.....
Vinegar.....	2 teaspoons	10	.4	.....	.....	.....	.....	.....	.....	.....
Product.....	½ cup	90	3.2	257	31	114	112	35	1.2	¼

NISHIME

Wash and tie the kombu in knots; cut between the knots with a pair of scissors or with a knife. Add water and cook slowly for 30 minutes, when the water will have partly evaporated. To this add the vegetables cut in small, irregular pieces, and the dried bonito. When the vegetables are nearly done, add sugar and shoyu and cook until the shoyu is absorbed. Nishime may be served hot or cold.

TABLE 15.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in nishime for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces	
		Grams	Ounces							
Kombu.....	18 inches	11	0.4	23	10	1	12	.....	.....	.....
Water.....	½ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gobo.....	¼ cup	46	1.6	33	5	1	27	.....	.....	.....
Carrots.....	¼ cup	40	1.4	18	2	1	15	.....	.....	.....
Daikon.....	⅓ cup	78	2.7	9	2	2	5	.....	.....	.....
Japanese taro.....	1 cup	161	5.7	109	9	1	99	.....	.....	.....
Dried bonito.....	3 tablespoons	3	.1	9	9	.....	.....	.....	.....	.....
Sugar.....	2 teaspoons	9	.3	37	.....	.....	37	.....	.....	.....
Shoyu.....	3 tablespoons	42	1.5	21	13	.....	8	.....	.....	.....
Product.....	2½ cups	414	14.6	259	50	6	203	160	5.7	⅔

NIGOME

Cut the vegetables, aburage, and konnyaku in $\frac{1}{4}$ -inch cubes, place them in a sauce pan with $\frac{2}{3}$ of a cup of water, with the aburage on top. Let simmer for 20 to 30 minutes or until the vegetables are tender; add seasonings and continue the cooking for 5 to 10 minutes. Dried shrimps or a little pork may be added for flavor.

The Japanese state that gobo should be prepared 3 to 4 hours before it is used and be allowed to stand in water. The water should be changed several times during this period to prevent discoloration of the food with which it is cooked.

TABLE 16.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in nigome for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories	
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
Aburage.....	1 cup	22	0.8	65	19	44	2	.....	.....	.....
Carrots.....	$\frac{1}{2}$ cup	58	2.0	26	2	2	22	.....	.....	.....
Konnyaku.....	$\frac{1}{2}$ cup	74	2.6	9	.....	.....	9	.....	.....	.....
Japanese taro.....	$\frac{1}{2}$ cup	68	2.4	46	4	.....	42	.....	.....	.....
Daikon.....	$\frac{1}{2}$ cup	68	2.4	11	3	.....	8	.....	.....	.....
Gobo.....	$\frac{1}{2}$ cup	40	1.4	55	2	.....	53	.....	.....	.....
Water.....	$\frac{2}{3}$ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dried bonito.....	$\frac{1}{4}$ cup	4	.1	12	12	.....	.....	.....	.....	.....
Sugar.....	2 tablespoons	24	.8	96	.....	.....	96	.....	.....	.....
Shoyu.....	$\frac{1}{4}$ cup	56	2.0	28	16	.....	12	.....	.....	.....
Product.....	2 $\frac{1}{2}$ cups	452	15.9	348	58	46	244	130	4.8	$\frac{3}{4}$	

KIRAZU WITH VEGETABLES

Finely shred all the foods; add water and cook the whole until the vegetables are tender. Add sugar and shoyu and let simmer for 5 minutes. Add kirazu and green onions, heat thoroughly, and occasionally stir to prevent burning. Dried shrimps or pork may be used for flavoring instead of bonito. The kirazu may be heated in a pan with fat and then added to the vegetables.

TABLE 17.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in kirazu with vegetables for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories	
					Protein	Fat	Carbohydrate	Grms.	Ounces		Cups
Carrots.....	$\frac{1}{3}$ cup	35	1.2	16	1	1	14	.....	.....	.....
Aburage.....	$\frac{1}{3}$ cup	9	.3	27	8	18	1	.....	.....	.....
Konnyaku.....	$\frac{1}{3}$ cup	56	2.0	7	.....	.....	7	.....	.....	.....
Gobo.....	$\frac{1}{3}$ cup	35	1.2	48	1	.....	47	.....	.....	.....
Flaked bonito.....	2 tablespoons	2	.1	6	6	.....	.....	.....	.....	.....
Water.....	$\frac{1}{2}$ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sugar.....	1 tablespoon	12	.4	48	.....	.....	48	.....	.....	.....
Shoyu.....	2 tablespoons	28	1.0	14	8	.....	6	.....	.....	.....
Kirazu.....	2 cups	251	8.9	147	48	38	61	.....	.....	.....
Green onions.....	$\frac{1}{8}$ cup	14	.5	2	.....	.....	2	.....	.....	.....
Product.....	3 cups	487	17.1	315	72	57	186	155	5.4	1	

NOODLES (SOMEN OR UDON)

The ingredients required for this dish are noodles, flaked bonito, water, green onions, aburage, kamaboko, mushrooms, shoyu, and salt.

Place unbroken noodles in boiling water and boil them for 20 minutes. Drain and wash them under cold running water to keep them from sticking together. Add them to hot or to cold stock made as follows: To dried bonito add 4 cups of water and let simmer for 15 minutes; strain, and then discard the bonito. Add the soaked mushrooms and shredded aburage to the stock and let boil for a few minutes. Season the stock with salt and shoyu and pour the whole over the drained noodles. Garnish with finely cut green onions, shredded aburage, and thin slices of mushroom and of kamaboko. If they are to be served hot the noodles should be immersed in boiling water and the hot stock poured over them.

TABLE 18.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in noodles for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grms.	Ounces	
		Grams	Ounces							
Noodles.....	3 packages	246	8.7	781	104	17	660	.....	.....	.....
Flaked bonito 1..	1 cup	16	.6	.....	.....	.....	.....	.....	.....	.....
Water.....	4 cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Green onions.....	2 tablespoons	6	.2	1	.....	.....	1	.....	.....	.....
Aburage.....	2 tablespoons	6	.2	18	5	12	1	.....	.....	.....
Kamaboko.....	12 thin slices	36	1.3	33	16	.....	17	.....	.....	.....
Mushrooms.....	2 large	19	.7	63	12	2	49	.....	.....	.....
Shoyu.....	¾ cup	168	6.9	86	52	.....	34	.....	.....	.....
Salt.....	1 tablespoon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Product.....	10½ cups	2,345	82.6	982	189	31	762	239	8.4	1

1 For stock

VINEGAR SAUCE FOR SUSHI

Make a sauce by mixing vinegar, sugar, and bonito. Let it stand for at least 30 minutes and then strain out the bonito.

TABLE 19.—*Kind, measure, and weight of the ingredients used, and the distribution of calories in vinegar sauce for sushi for use as needed*

Ingredients	Measure	Weight		Total calories	Distribution of calories		
					Protein	Fat	Carbohydrate
		Grams	Ounces				
Vinegar.....	½ cup	118	4.2	13	8	.....	5
Flaked bonito 1..	2 tablespoons	.....	.....	.....	.....	.....	.....
Sugar.....	4 tablespoons	40	1.4	160	.....	.....	160
Product.....	½ cup	155	5.5	173	8	.....	165

1 For flavoring only

INARI-SUSHI

The ingredients required for this dish are rice, water, salt, aburage, carrots, mushrooms, string beans, gobo, flaked bonito, water, sugar, shoyu, and vinegar sauce. Wash the rice thoroughly, drain, and add cold water. Salt may be added at this point, or after cooking is done.⁸ Place the rice over a hot fire and when the steam lifts the cover reduce the fire and let the rice simmer for 20 to 30 minutes or until it is done. Rice cooked in this way tends to be rather dry with the grains well shaped and separate. Cut the aburage triangle in two pieces and remove the soft inside portion, forming two cornucopias. Shred the carrots, mushrooms, string beans, gobo, and inner portion of the aburage, add the bonito and water, and cook until almost done; add sugar and shoyu and finish the cooking. Strain off the juice, add it to the aburage cornucopias, and let simmer for a few minutes. Cool the rice, mix it with one third of a cup of vinegar sauce and cooled vegetables, and place in the aburage cornucopias. These are always served cold, and are a favorite dish with the Japanese.

⁸ Japanese ordinarily never add salt to rice because they usually eat rice with salted vegetables or with vegetables seasoned with shoyu.

TABLE 20.—*Kind, measure, and weight of the ingredients used, and the number of calories and their distribution in inari-sushi for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate	Grams	Ounces		Cornucopia
		Grams	Ounces							
Rice.....	1 ¾ cups	240	8.5	842	77	6	759	.....	.....	.....
Water 1.....	1 ¾ cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Salt.....	2 teaspoons	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aburage.....	3 triangles	48	1.6	141	40	96	5	.....	.....	.....
Carrots.....	3 tablespoons	18	.6	8	1	.....	7	.....	.....	.....
Mushrooms.....	1½ medium	5	.2	17	3	1	13	.....	.....	.....
String beans.....	3 tablespoons	21	.7	9	2	1	6	.....	.....	.....
Gobo.....	3 tablespoons	15	.5	11	2	.....	9	.....	.....	.....
Flaked bonito.....	1½ tablespoons	2	1	6	6	.....	.....	.....	.....	.....
Water 2.....	½ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sugar.....	1½ teaspoons	6	.2	24	.....	.....	24	.....	.....	.....
Shoyu.....	1½ teaspoons	21	.7	11	7	.....	4	.....	.....	.....
Product.....	6 stuffed cornucopias	726	25.6	1,069	138	104	827	68	2.4	½

1 For rice.

2 For vegetables.

MAKI-SUSHI

The ingredients required for maki-sushi are rice, water, salt, kampyo, mushrooms, gobo, watercress, flaked bonito, sugar, shoyu, egg, salt, kamaboko, roast eel, and nori.

Make a sauce by mixing the vinegar, the sugar, and the bonito. (See p. 36). Let it stand for at least 30 minutes and then strain out the bonito. Cook the rice as directed for inari-sushi (p. 37). Cut the mushrooms, gobo, kampyo, and watercress in narrow strips, and cook everything except the watercress in water with the bonito until almost done. Add sugar and shoyu and complete the cooking. Dip the watercress in boiling water for a minute. Beat egg and salt together and cook the mixture in hot fat. Cut the cooked egg and the kamaboko in strips one-fourth inch wide. Let the rice cool slightly and mix it with half of a cup of vinegar sauce. Moisten the bamboo mat (fig. 25) with vinegar sauce, cover with a piece of nori, and spread with $1\frac{2}{3}$ cups of cooked rice. Make a firm even layer by pressing the mixture down with the fingers moistened with vinegar sauce. Place the strips of gobo, mushrooms, watercress, kampyo, cooked egg, and roasted eel crosswise in the center and roll by means of the bamboo mat (fig. 25). Press firmly, remove the mat, and serve in slices (fig. 15).

TABLE 21.—*Kind, measure, and weight of the ingredients used, and the distribution of calories and their number in maki-sushi for six average servings*

Ingredients	Measure	Weight		Total calories	Distribution of calories			Wt. yielding 100 calories		Measure for 100 calories
					Protein	Fat	Carbohydrate			
								Grams	Ounces		Grms.	Ounces	Cups
Rice.....	2 cups	375	13.2	1,315	120	10	1,185	.....	.....	.....
Water 1.....	2 cups	.....	.....	.....	.....	.....	.....	.....	.....	.....
Salt.....	3¾ teaspoons	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kampyo.....	1½ tablespoon	6	.2	15	2	.....	13	.....	.....	.....
Mushrooms.....	1 ½ medium	5	.2	17	5	1	13	.....	.....	.....
Gobo.....	9 strips 6 by ¾ inches	18	.6	12	2	.....	10	.....	.....	.....
Watercress.....	4 tender stalks 9 inches	35	1.2	5	3	.....	2	.....	.....	.....
Flaked bonito.....	1½ tablespoons	2	.1	6	6	.....	.....	.....	.....	.....
Sugar.....	1½ teaspoons	6	.2	24	.....	.....	24	.....	.....	.....
Shoyu.....	1½ tablespoons	21	.7	11	7	.....	4	.....	.....	.....
Water 2.....	½ cup	.....	.....	.....	.....	.....	.....	.....	.....	.....
Egg.....	¾	35	1.2	52	19	33	.....	.....	.....	.....
Salt.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kamaboko.....	9 strips 6 by ¾ inches	24	.9	22	11	.....	11	.....	.....	.....
Roast eel.....	¼ cup	50	1.8	120	56	64	.....	.....	.....	.....
Nori.....	3 sheets	9	.3	.....	.....	.....	.....	.....	.....	.....
Product.....	3 rolls	1,034	36.5	1,599	229	107	1,262	65	2.3	⅓ of 1 roll

1 For rice.

2 For vegetables.

MENU

The following two menus are representative of the meals of Japanese with low incomes. Japanese of higher incomes would probably supplement their diet with cooked beans for breakfast and with meat or fish for lunch and for dinner. Many Japanese in Hawaii eat a combination of Japanese and American foods.

BREAKFAST

- (1) Miso soup with wakame; rice; pickled daikon; tea.
- (2) Miso soup with daikon; rice; pickled cabbage; fried egg seasoned with shoyu and sugar; tea.

LUNCH

- (1) Rice; kirazu with vegetables; boiled watercress with shoyu and sesame seeds; tea.
- (2) Rice; eggplant with miso; pickled daikon; tea.

SUPPER

- (1) Rice; fish cake with miso; cucumber and grated ginger in vinegar-sugar sauce; tofu shoyu soup; tea.
- (2) Rice; tofu soup with lemon; raw fish with cucumber and lettuce served with shoyu and grated ginger sauce; tea.

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APPENDIX

COMPOSITION OF SOME JAPANESE FOODS USED IN HAWAII

At the Hawaii station the nutritive constituents of some Japanese foods were determined by methods outlined by the Association of Official Agricultural Chemists (1), the calcium and the phosphorus being determined volumetrically. Iron was determined by the ferric thiocyanate colorimetric method (17, p. 216). The food samples were bought direct from the shops manufacturing the products, with the exception of hukusai, which was prepared in the laboratory. The edamame were bought on the open market at the stage of maturity usually desired by the Japanese for this product. The beans, which were tender and of a fresh green color, similar in appearance to young lima beans were boiled in the pods for 20 minutes, removed from the pods, and dried for analysis.

The figures given for kirazu, konnyaku, natto, and tofu are averages of the analyses of two separate samples obtained from different sources. The figures for kogi, miso, tonyu, and edamame are averages of duplicate analyses on single samples. The figures for hukusai represent the average of analyses on two separately prepared lots of cabbage.

The figure for carbohydrates for foods analyzed in Honolulu are calculated by difference. Dr. Saiki states that carbohydrates given in their analyses were determined by Bertrand's method.

The figures given by Saiki and coworkers for CaO , P_2O_5 , and Fe_2O_3 , have been recalculated as Ca, P, and Fe, to conform to the more general American usage. All other figures are quoted exactly.

Table 1 gives the nutritive constituents and mineral elements and the gram weight per 100 calories of some Japanese foods.

TABLE 1.—Composition of some Japanese foods commonly used in Hawaii
(Results expressed as percentages of edible material)

Japanese name	English name or description	Water		Protein (Nx6.25)		Fat		Carbohydrates (by difference)		Fiber		Total ash		Sodium chloride (Na Cl)		Calcium (Ca)		Phosphorus (P)		Iron (Fe)		Weight for 100 Calories			
		Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Grams	Grams	
Aburage	Fried bean curd.....	53.20	21.10	22.00	4.13	2.70	1.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Edamame *	Cooked green soybeans (beans only).....	63.80	14.40	3.45	13.80	.....	3.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fu	Gluten cakes.....	11.30	31.20	.91	56.50	.....	5.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Goma (Kurogoma)	Sesame seeds (black).....	7.77	19.55	45.35	8.85	.....	4.33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hukusai *	Leaf cabbage pickled in a paste of salt and rice bran.....	88.55	2.04	.24	5.33	.....	2.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iriko:	Small dried fish.....	43.92	40.01	4.13	.....	.....	12.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chirimen-iriko	.....	17.80	58.70	4.28	.....	.....	19.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oba-iriko	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kaiso-ru:	Seaweeds.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kanten	Agar agar.....	20.10	2.30	.13	71.70	.....	2.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kombu	.....	16.30	22.70	1.21	27.70	.....	4.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nori (Asakusa-nori)	.....	11.10	35.20	.....	43.50	.....	8.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wakame	.....	23.50	11.60	1.44	42.20	.....	3.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kamaboko	Fish cake.....	73.70	11.10	.06	11.90	.....	2.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kampyo	Strips of dried edible gourd.....	33.70	7.60	.13	56.00	.....	1.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Katsuo-bushi	Dried bonito.....	21.10	74.75	.47	.....	.....	4.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kinoko:	Mushrooms.....
Matsutake	Canned mushrooms.....	87.70	1.90	.34	6.20	.....	2.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shitake (hoshi)	Dry mushrooms.....	17.20	15.50	1.45	64.00	.....	1.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kirazu *	Residue from making tofu.....	82.86	4.77	1.66	6.15	.....	3.93	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Koji *	Fermented rice.....	23.44	5.53	.15	69.59	.....	.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Konyaku *	.....	96.60	.09	.....	3.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miso *	Fermented rice and soybeans.....	57.14	6.61	1.87	27.91	.....	1.53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Natto *	Fermented soybeans.....	60.40	18.70	9.39	3.13	.....	6.49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shoyu	Soybean sauce.....	70.26	7.80	.....	5.00	.....	16.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tofu *	Soybean curd.....	84.71	8.98	4.05	1.58	.....	.03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Uonoyu *	Soybean milk.....	94.00	2.97	1.37	1.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Udon	Noodles.....	14.20	10.60	.79	67.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Umeboshi	Red-pickled plum.....	78.90	.50	1.33	4.90	.....	.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Analyses made at the Hawaii station. The other analyses were made by Saiki (12).

† Calcium analyses of kamaboko on sample obtained in Honolulu.

‡ Trace.

